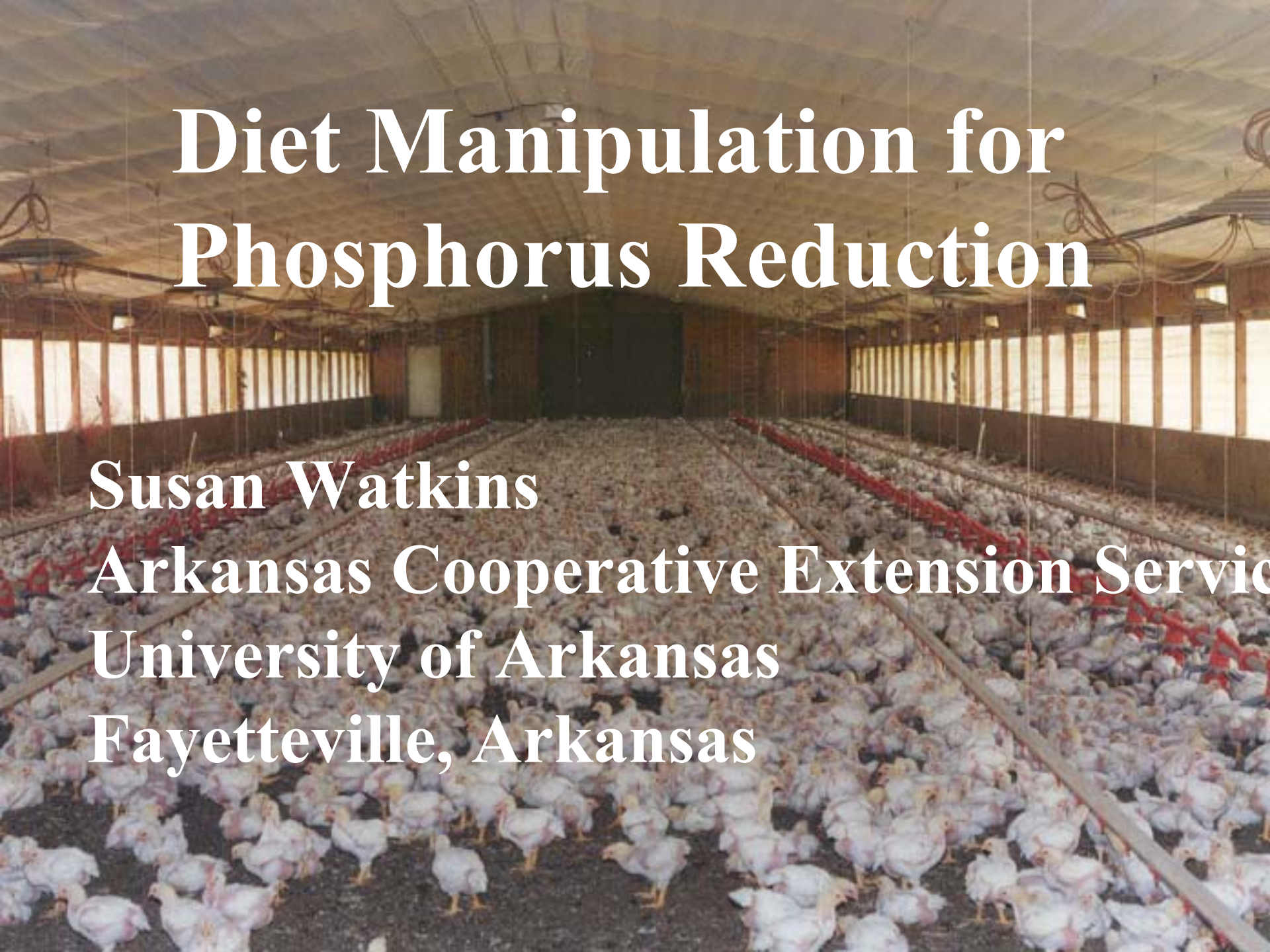
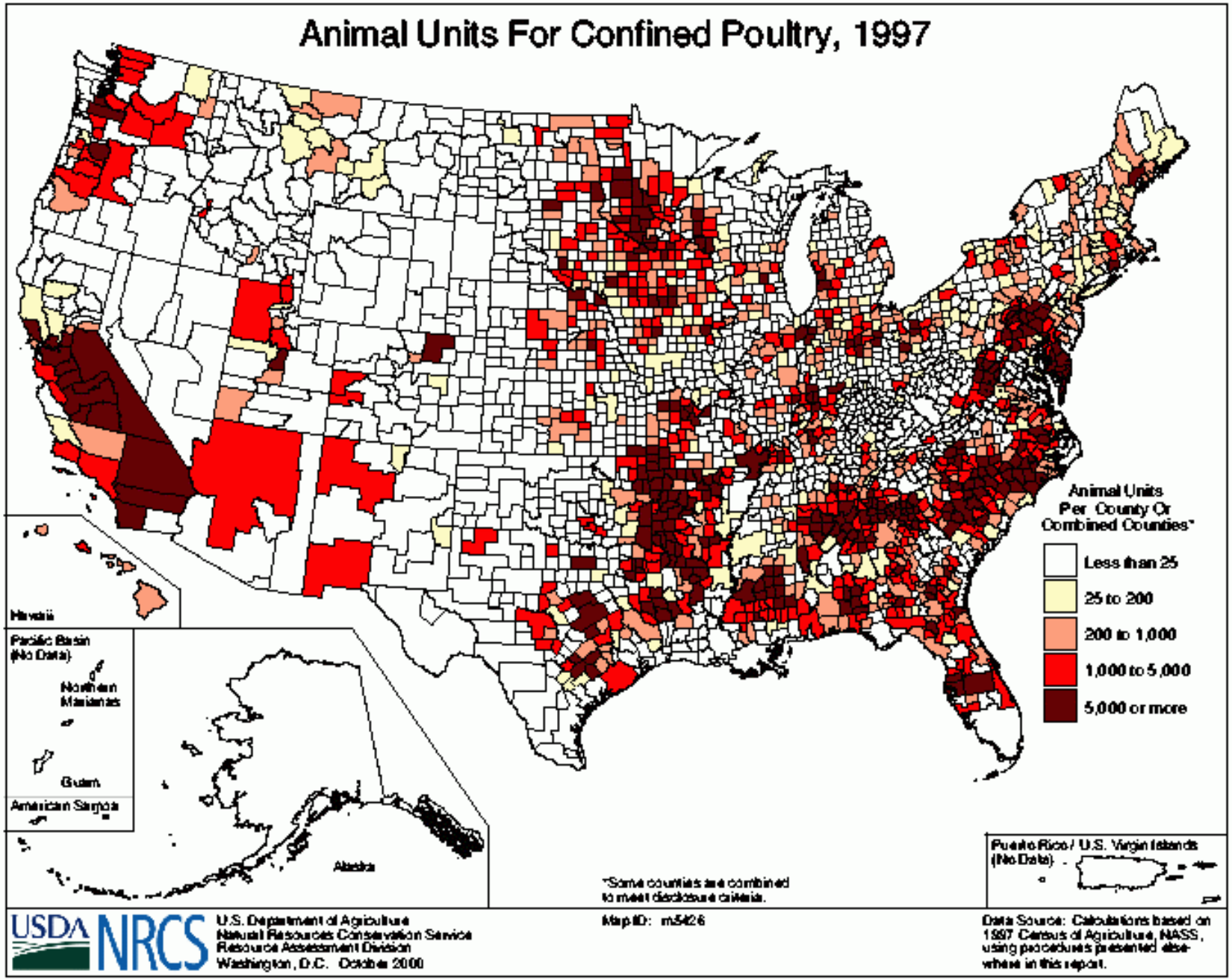
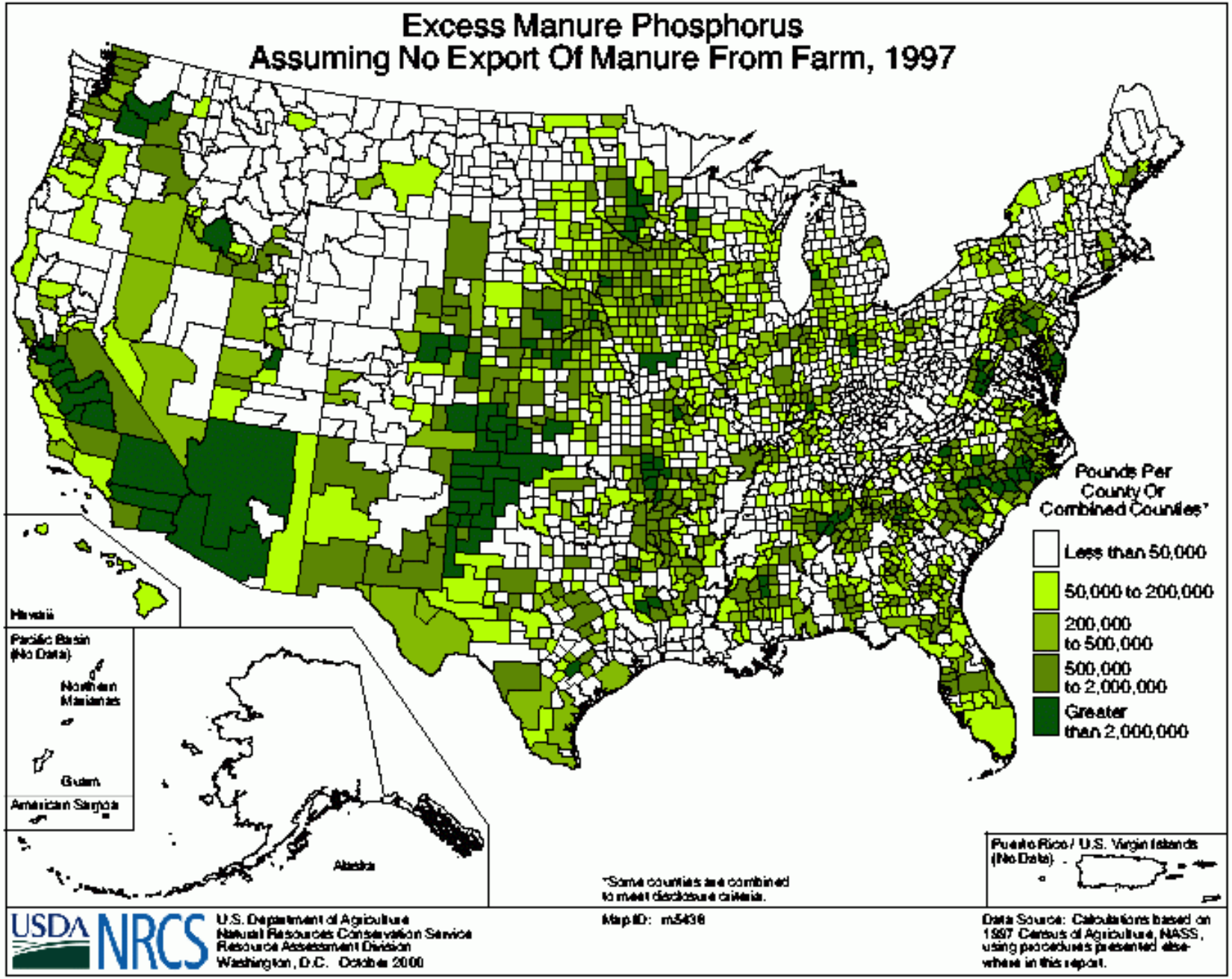
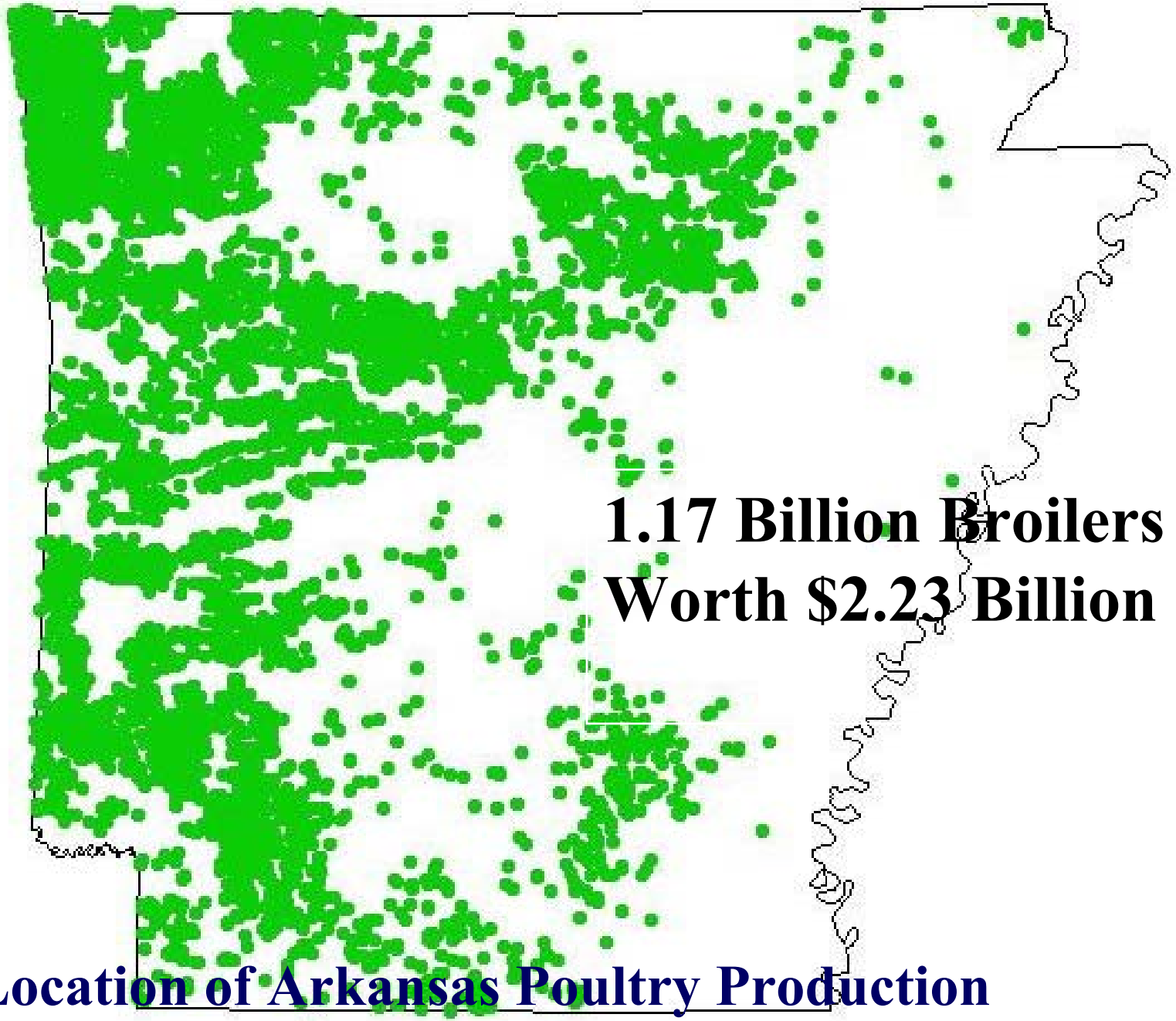


Diet Manipulation for Phosphorus Reduction

Susan Watkins
Arkansas Cooperative Extension Servic
University of Arkansas
Fayetteville, Arkansas


Animal Units For Confined Poultry, 1997
Animal Units Per County Or Combined Counties*
Less than 25
25 to 200
200 to 1,000
1,000 to 5,000
5,000 or more
Hawaii
Pacific Basin (No Data)
Northern Marianas
Guam
American Samoa
Alaska
Puerto Rico / U.S. Virgin Islands (No Data)
*Some counties are combined to meet disclosure criteria.
USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service
Resource Assessment Division
Washington, D.C. October 2000
Map ID: m5426
Data Source: Calculations based on 1997 Census of Agriculture, NASS, using procedures presented elsewhere in this report.


Excess Manure Phosphorus
Assuming No Export Of Manure From Farm, 1997
Pounds Per
County Or
Combined Counties*
Less than 50,000
50,000 to 200,000
200,000
to 500,000
500,000
to 2,000,000
Greater
than 2,000,000
Hawaii
Pacific Basin
(No Data)
Northern
Marianas
Guam
American Samoa
Alaska
Puerto Rico / U.S. Virgin Islands
(No Data)
*Some counties are combined
to meet disclosure criteria.
USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service
Resource Assessment Division
Washington, D.C. October 2000
Map ID: m5436
Data Source: Calculations based on
1997 Census of Agriculture, NASS,
using procedures presented else-
where in this report.



Location of Arkansas Poultry Production

Business & Farm

Arkansas Democrat Gazette Thursday, April 24, 2003

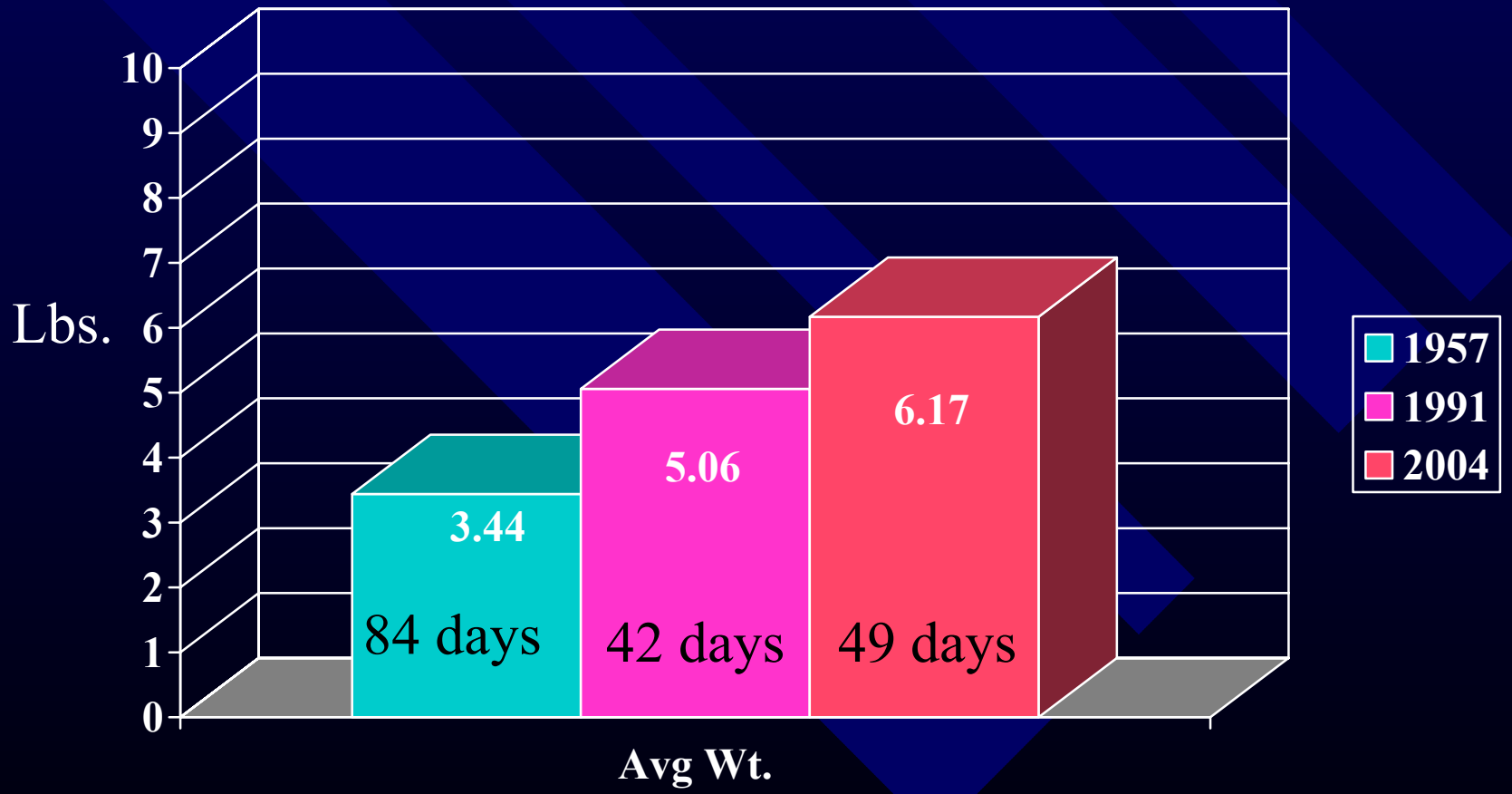
Farmers told to stop spreading litter

BY CRISTAL CODY
ARKANSAS DEMOCRAT-GAZETTE

SILOAM SPRINGS — Six poultry companies, including Simmons Foods Inc., are ordering farmers to stop spreading chicken litter on land in the Tulsa watershed in Northwest Arkansas and northeastern Oklahoma.

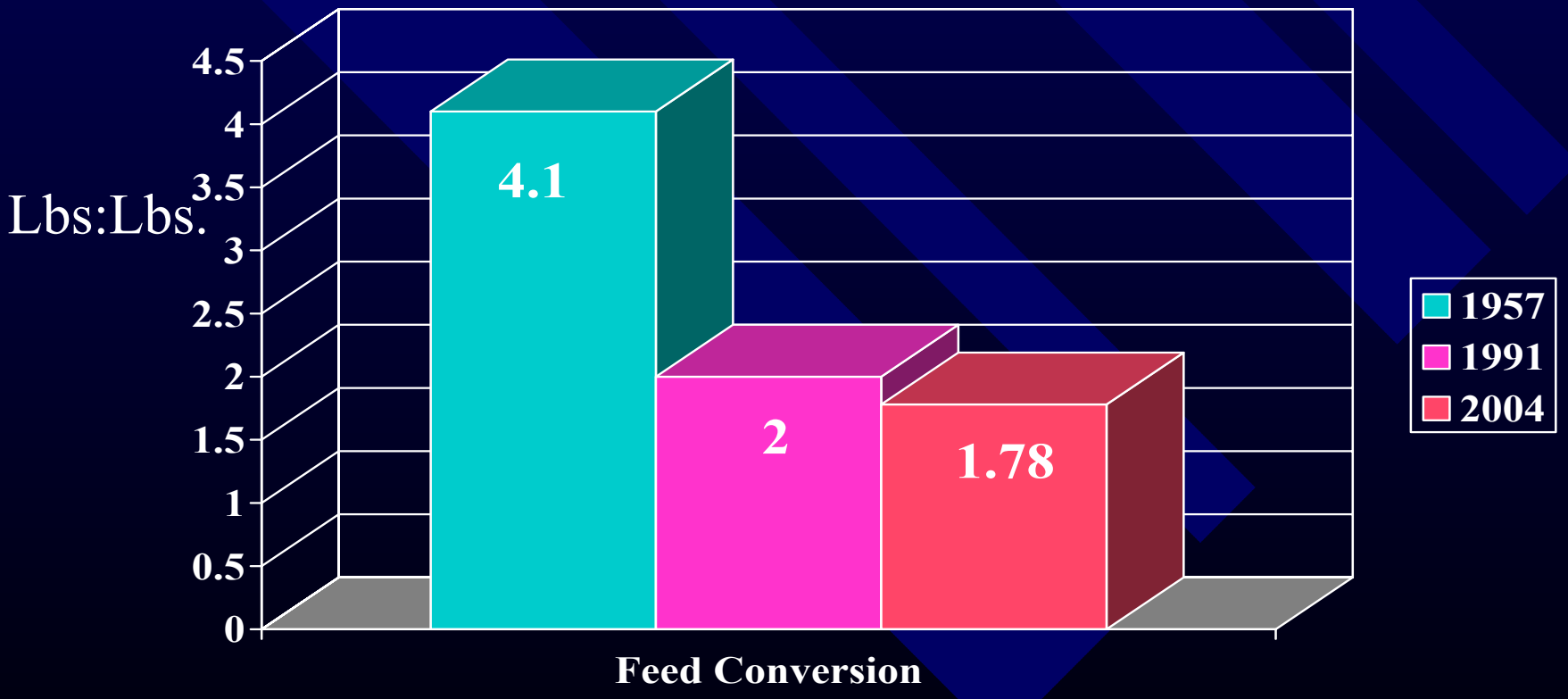
Farmers said this week that companies have threatened to cut off delivery of new chickens if the distribution of the poultry waste on farmland continues. Farmers,

First the Good News!



All male broilers

First the Good News!



Modern Broiler and Phosphorus Reduction

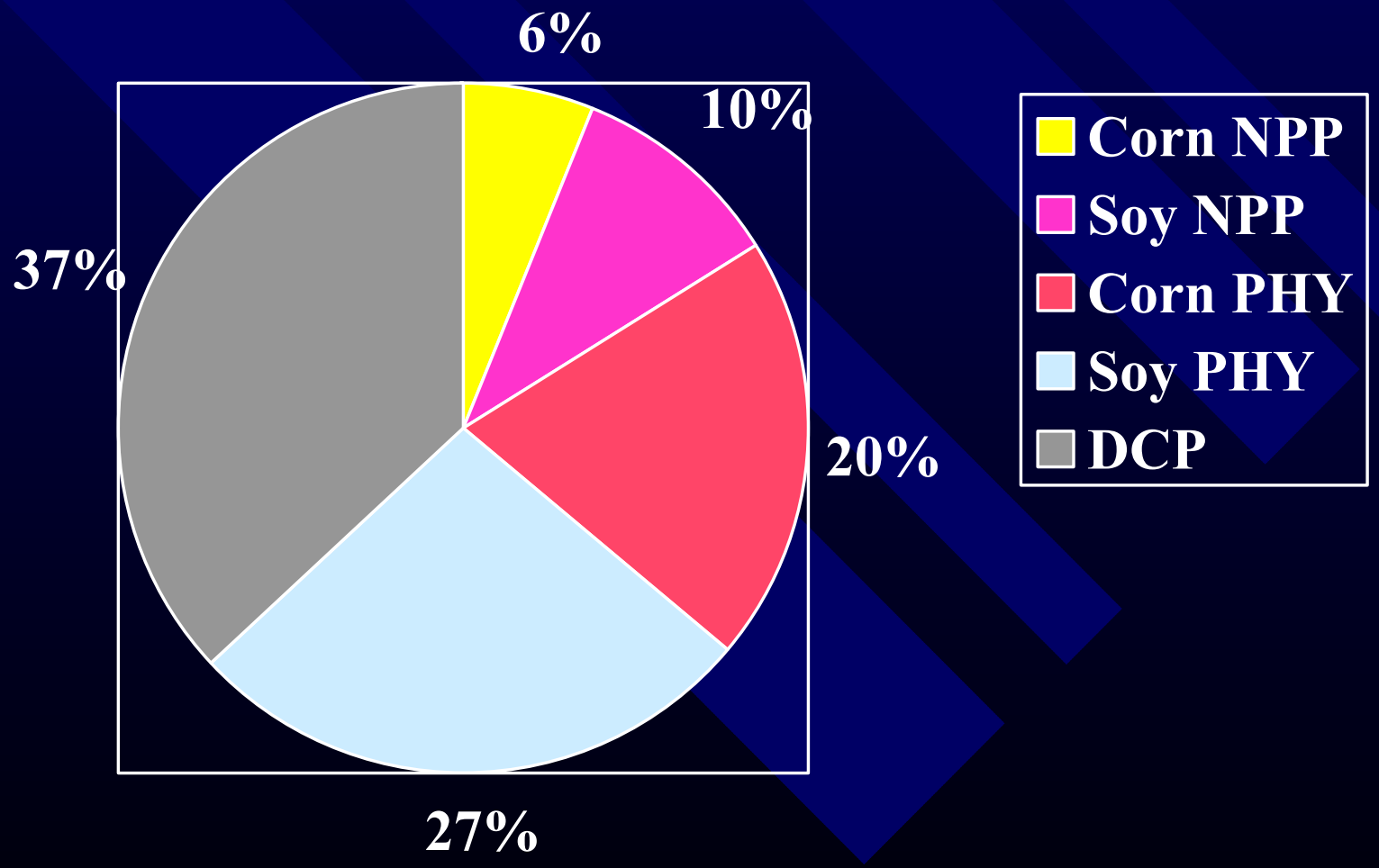
- Most efficient meat animal in production
- Selection for growth and efficiency leaves bird susceptible to:
  - Heart attacks
  - Leg disorders
  - Bone breakage at the processing plant
- Can control first by managing environment
- Adequate minerals in diet necessary to prevent leg disorders and bone breakage

Poultry industry faces dilemma

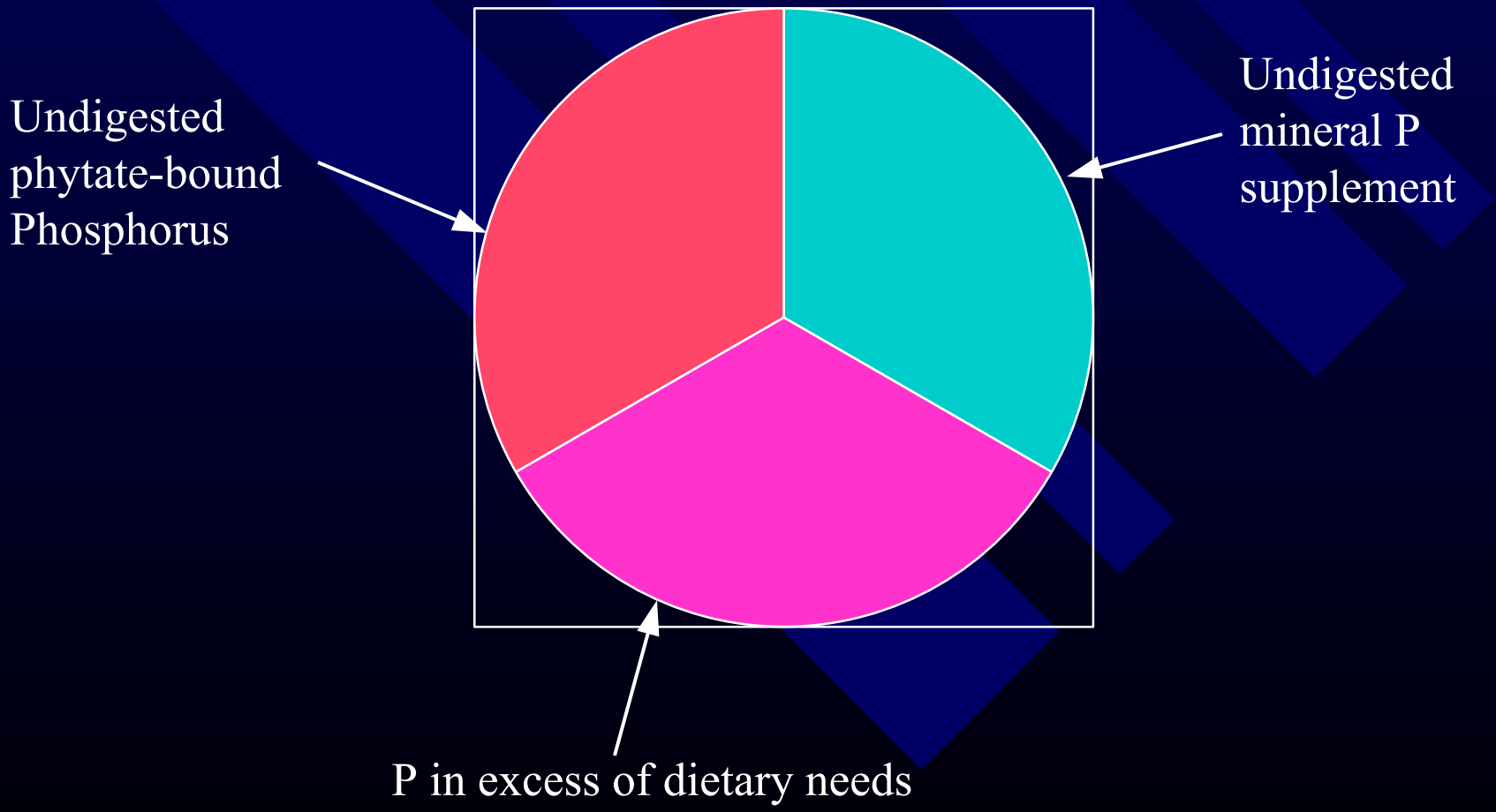
- Phosphorus one of the most critical nutrients related to overall performance.
- Demands placed on industry to reduce phosphorus output in many locales due to adverse effect on eutrophication of waters.
- We must balance needs of chicken with demands for reduced fecal output.

What is the Source of P in the diet?

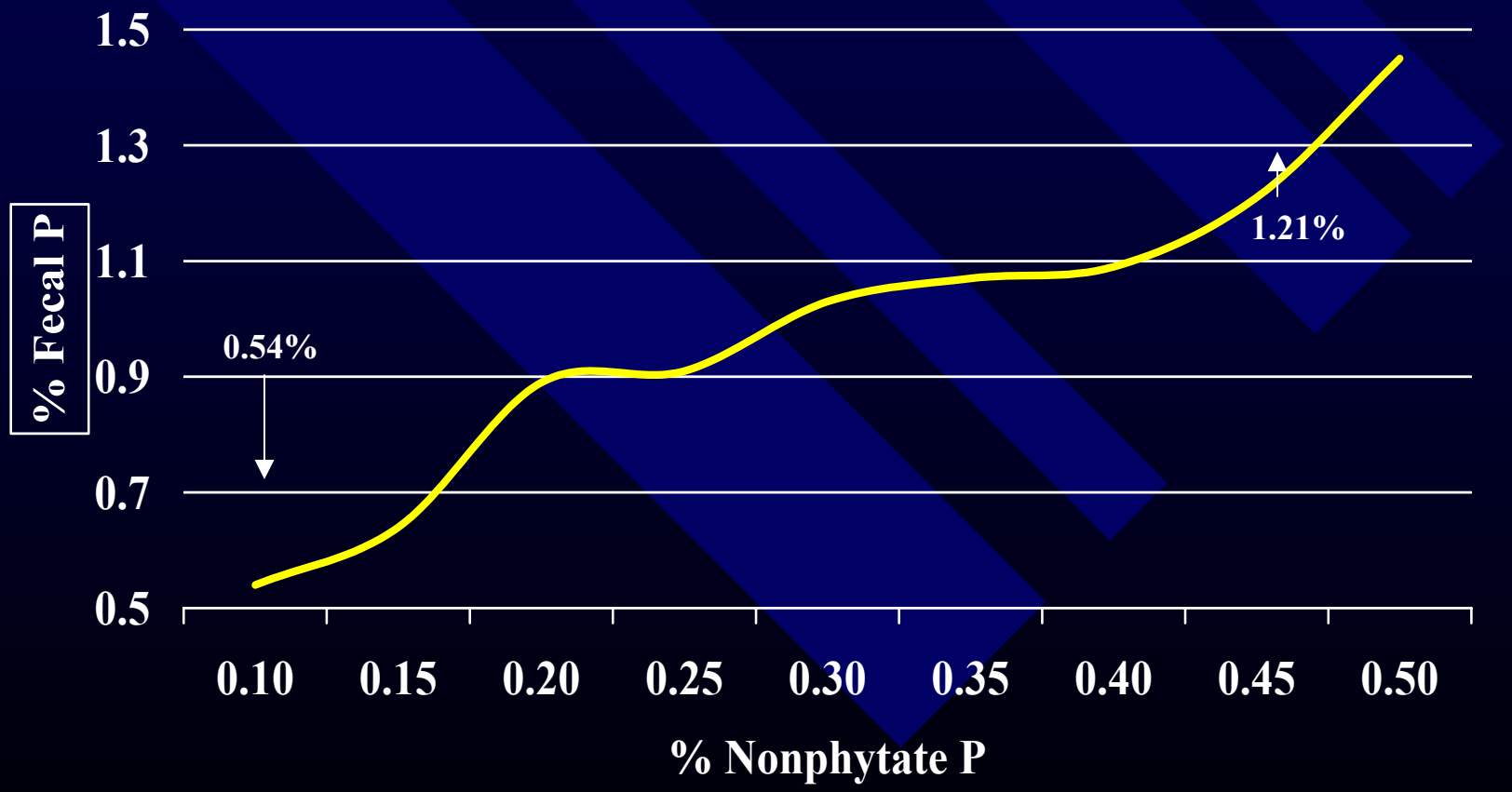
Percent total P from various sources in the chick diet



What is the source of excreted phosphorus?



About half of the P in excreta from young chicks comes from undigested mineral phosphates (Waldroup et al, 2000)



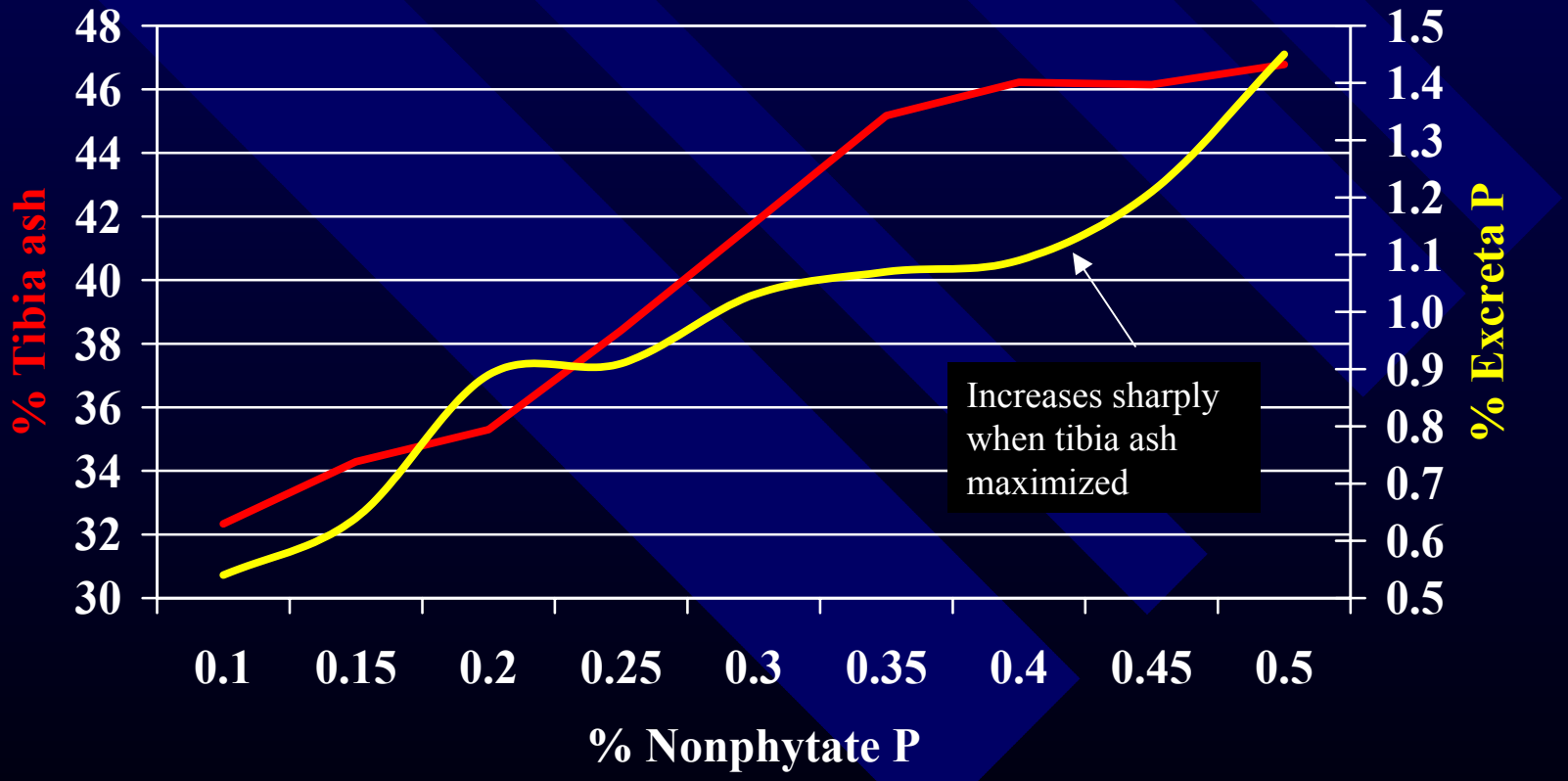
Phosphorus availability in some animal feedstuffs and feed phosphates measured in 3-wk old broilers (Van der Klis and Versteegh, 1996)

Source of Phosphorus	% Total P	% AP
Bone meal	7.6	59
Fish meal	2.2	74
Meat meal	2.9	65
Meat and bone	6.0	66
Ca-Na phosphate	18.0	59
Dicalcium phosphate (anhydrous)	19.7	55
Dicalcium phosphate (hydrous)	18.1	77
Monocalcium phosphate	22.6	84
Mono-dicalcium phosphate (hydrous)	21.3	79
Mono-sodium phosphate	22.4	92

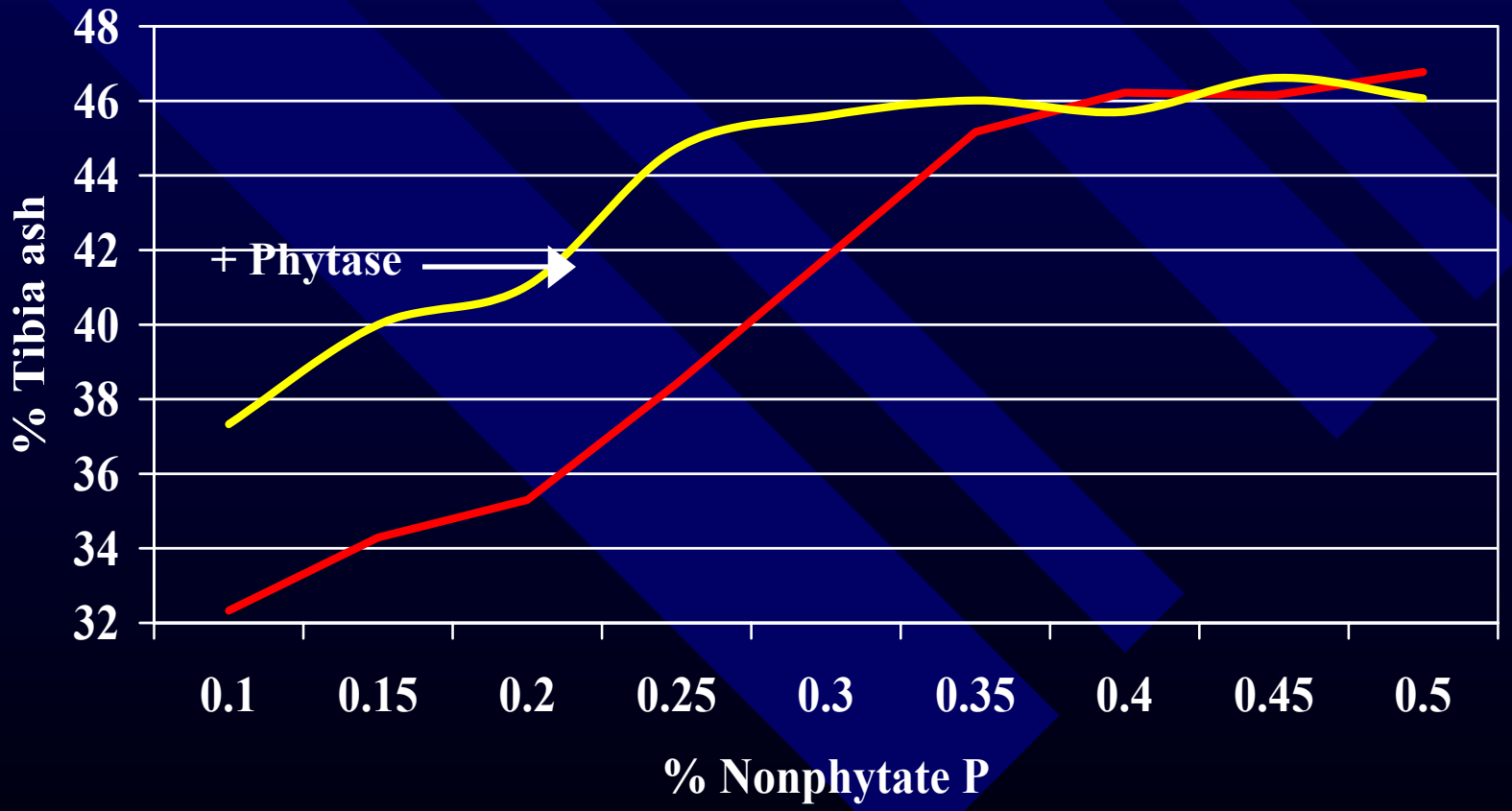
Controlled tests show that use of phytase coupled with reduction in dietary P will reduce the total and soluble P content in poultry litter

- Arkansas USDA group (Moore et al.)
- Delaware group (Sims, Saylor, Malone)

Relationship of tibia ash and excreta P content to dietary NPP level (Waldroup et al, 2000)



Relationship of tibia ash to phytase and dietary NPP level (Waldroup et al, 2000)



Effect of high available phosphorus corn and phytase enzyme addition to broiler diets on phosphorus runoff from tall fescue plots (Moore et al., 1998)

- Diets formulated using:
  - Normal yellow dent corn (YDC)
  - High available phosphorus (HAP) corn.
- Diets for each corn type fed W/WO 500 U/kg phytase.
- Diet NPP reduced 0.10% when HAP or phytase fed.
- Two consecutive flocks of birds grown and litter evaluated for total and soluble P.

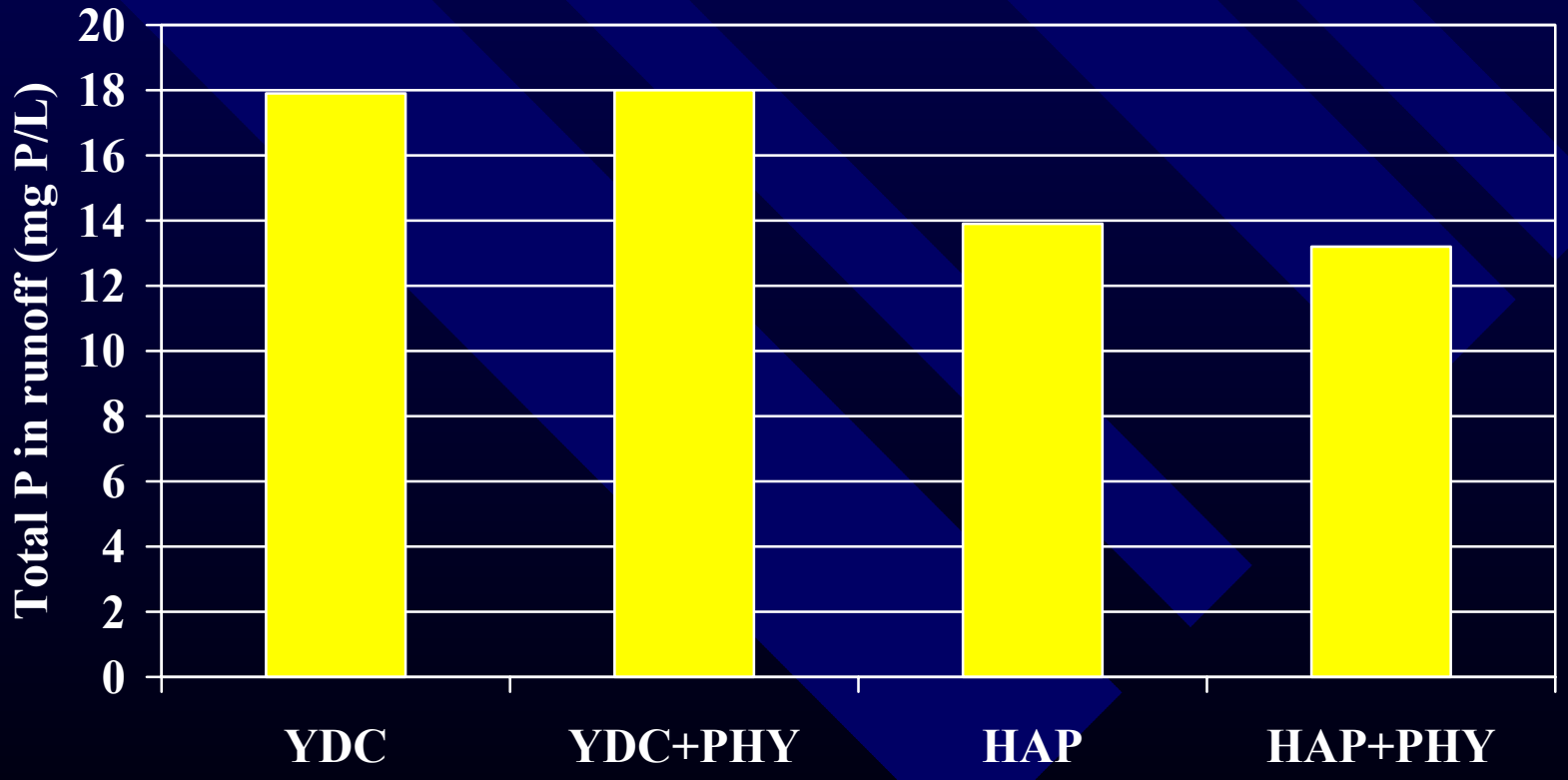
Total and soluble P content of litter at conclusion of two grow-out studies (Moore et al. 1998)

Treatment	Total P Mg/kg	Soluble P Mg/kg	Soluble: Total ratio
YDC	7,868 a	1,127 a	14.32
HAP	6,410 a	913 ab	14.24
YDC+Phy	8,068 a	944 ab	11.70
HAP+Phy	5,928 a	724 b	12.21

Total and soluble P content of litter at conclusion of three growout studies (Saylor et al. 2001)

Treatment	Total P Mg/kg	Soluble P Mg/kg	Soluble: Total ratio
YDC	14,320 a	2,394 a	16.71
HAP	13,821 a	2,349 a	16.99
YDC+Phy	12,115 a	2,157 a	17.80
HAP+Phy	11,092 a	1,235 a	11.13

Dietary treatments did not significantly affect P concentrations in runoff water from different litter treatments from USDA study (Moore et al. 1998)



NSD even though HAP and HAP + Phytase were 22 and 26% lower than YDC

A Modified Phosphorus Program Based on Commercial Feeding Intervals

Christine Fritts and Park Waldroup
Poultry Science Department
University of Arkansas

Introduction

- Previous trials in Waldroup lab have evaluated NPP needs for different age periods with and without phytase.
- These were combined into one feeding program from hatch to market and successfully used to grow birds with significant reduction in excreta P.
- However, feeding periods used in these studies matched NRC but not industry.

Nonphytate Phosphorus and Calcium Levels in Modified Programs

Age (d)	Industry	MOD 1	MOD 2	MOD 3
0 to 14	0.45/1.0	0.40/0.9	0.40/0.9	0.40/0.9
14 to 35	0.40/0.9	0.30/0.8	0.30/0.8	0.30/0.8
35 to 42	0.35/0.8	0.20/0.6	0.20/0.6	0.15/0.6
42 to 56	0.30/0.8	0.15/0.5	0.10/0.5	0.15/0.6

Phytase added to modified diets at 0 or 1200 FTU/kg (Natuphos, BASF)

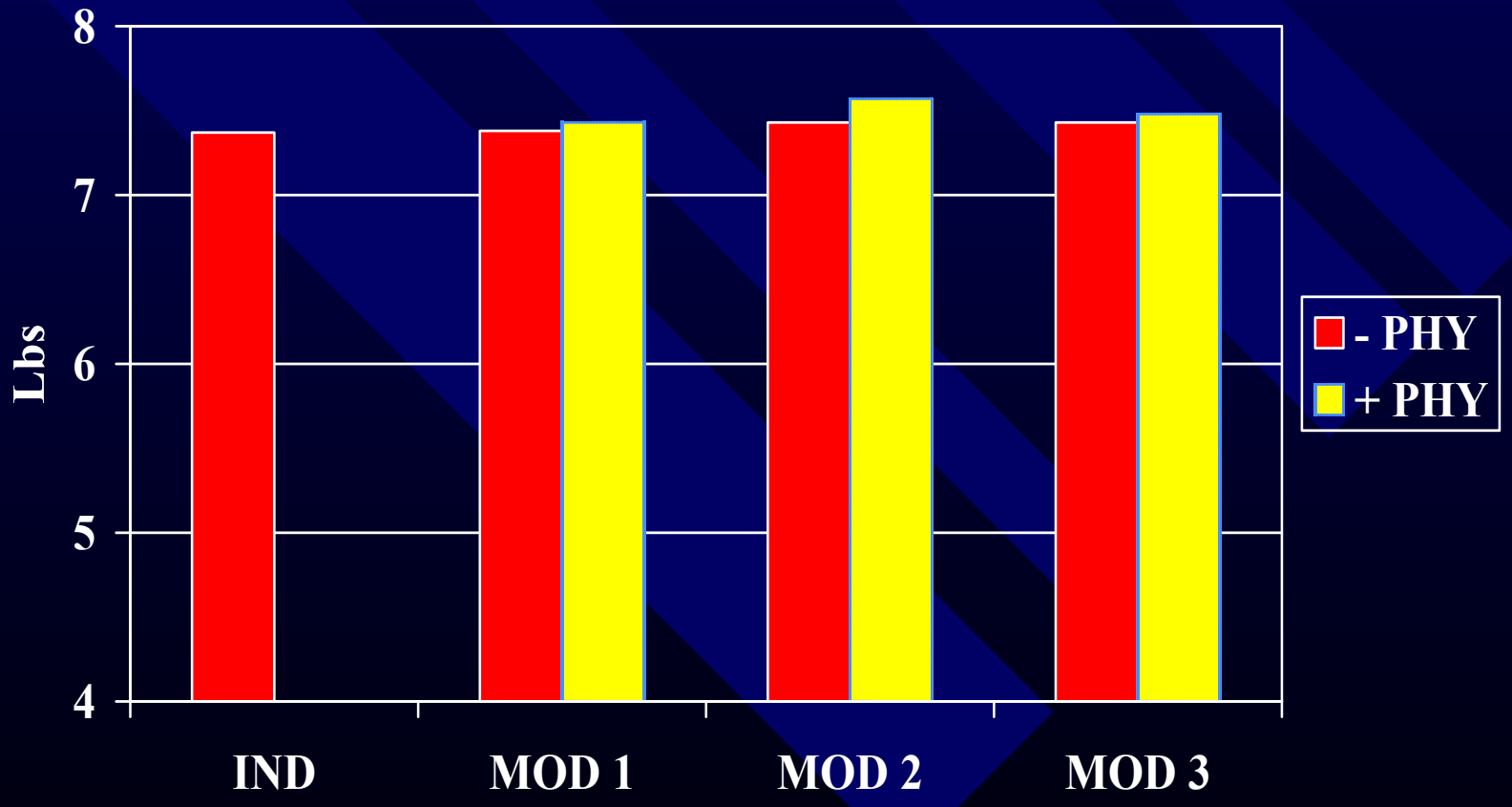
Composition (%) of diets for modified phosphorus study

Ingredients	0-14 d	14-35 d	35-42 d	42-56 d
Yellow corn	50.97	56.57	61.72	66.95
Soybean meal	39.45	33.88	28.70	23.13
Poultry oil	4.96	5.28	5.66	5.90
Salt	0.51	0.51	0.51	0.49
VIT/TM	0.30	0.30	0.30	0.30
Coban/BMD	0.12	0.12	0.12	0.12
L-Thr	0.00	0.00	0.02	0.07
L-Lys HCl	0.00	0.00	0.00	0.10
DL-Met	0.24	0.24	0.19	0.23
VARIABLE	**3.15**	**2.81**	**2.47**	**2.41**
TOTAL	100.00	100.00	100.00	100.00

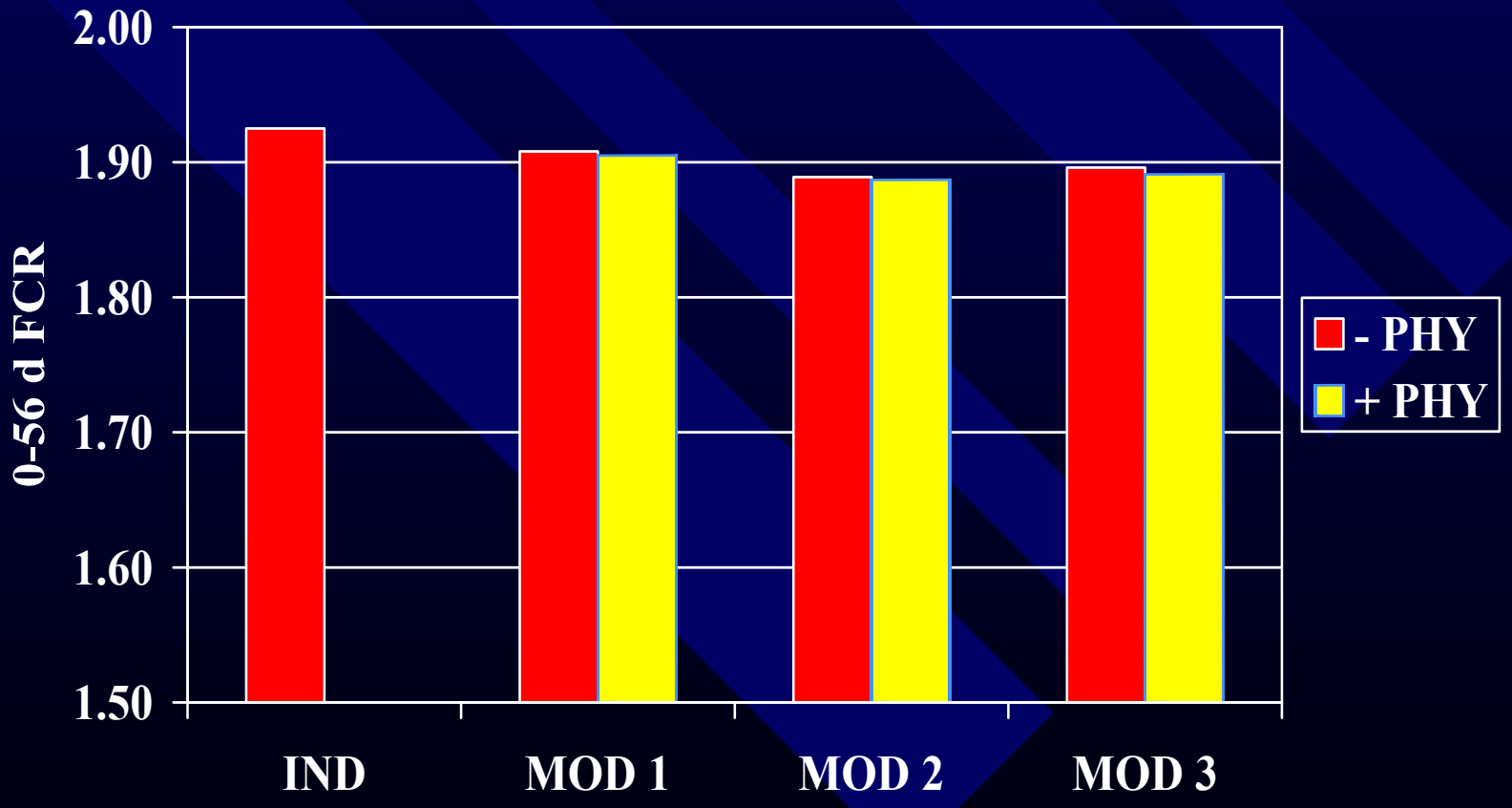
Materials and Methods

- Two consecutive trials of identical design.
- Six pens of 70 males (Cobb 500) per treatment for each feeding trial (0.8 ft^2).
- Treatments maintained in same pens for both trials.
- Started on new litter, caked and top dressed at the end of the first trial.

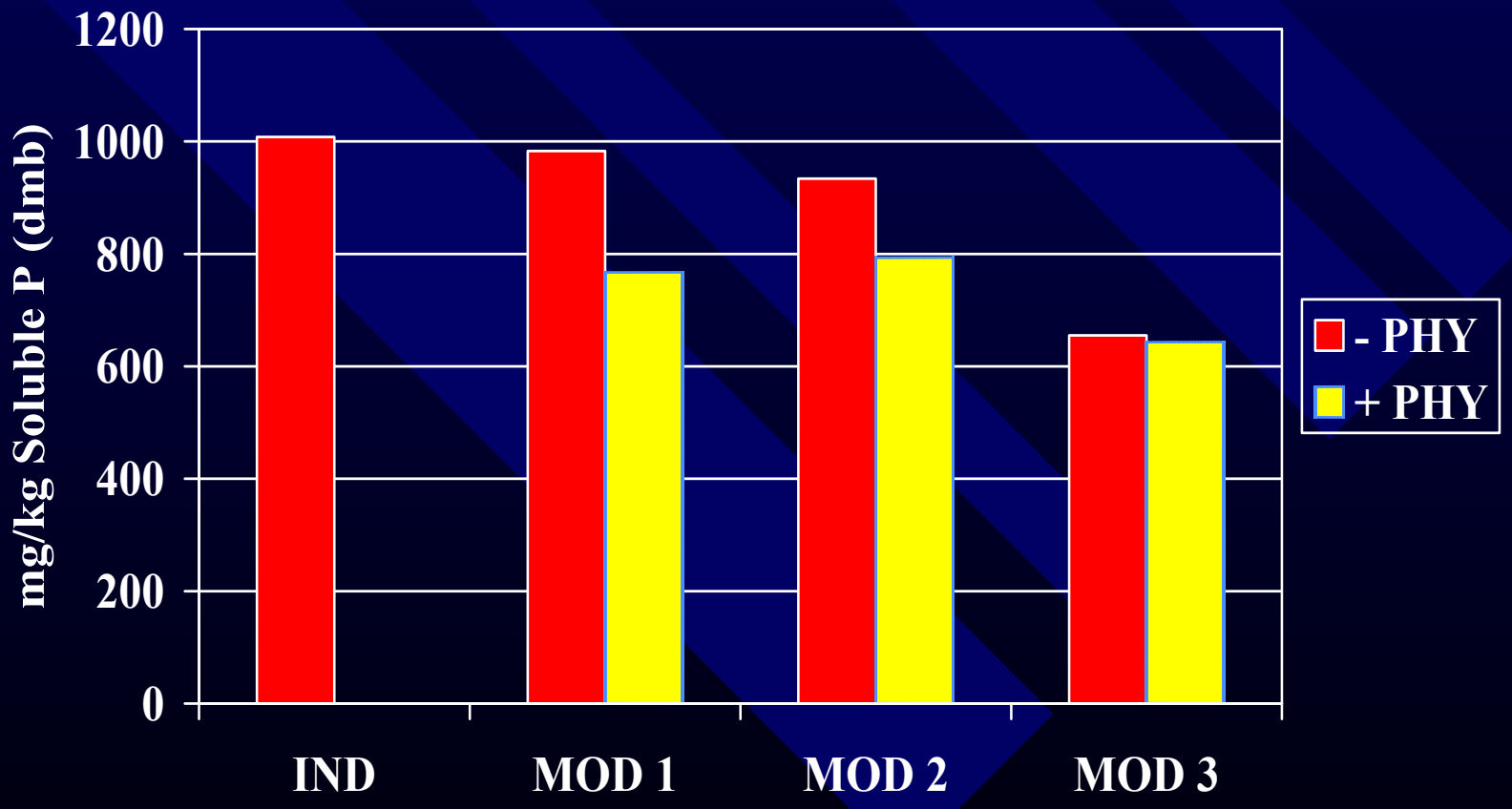
Body weight of broilers fed different NPP programs with or without phytase



Feed conversion by broilers fed different NPP programs with or without phytase

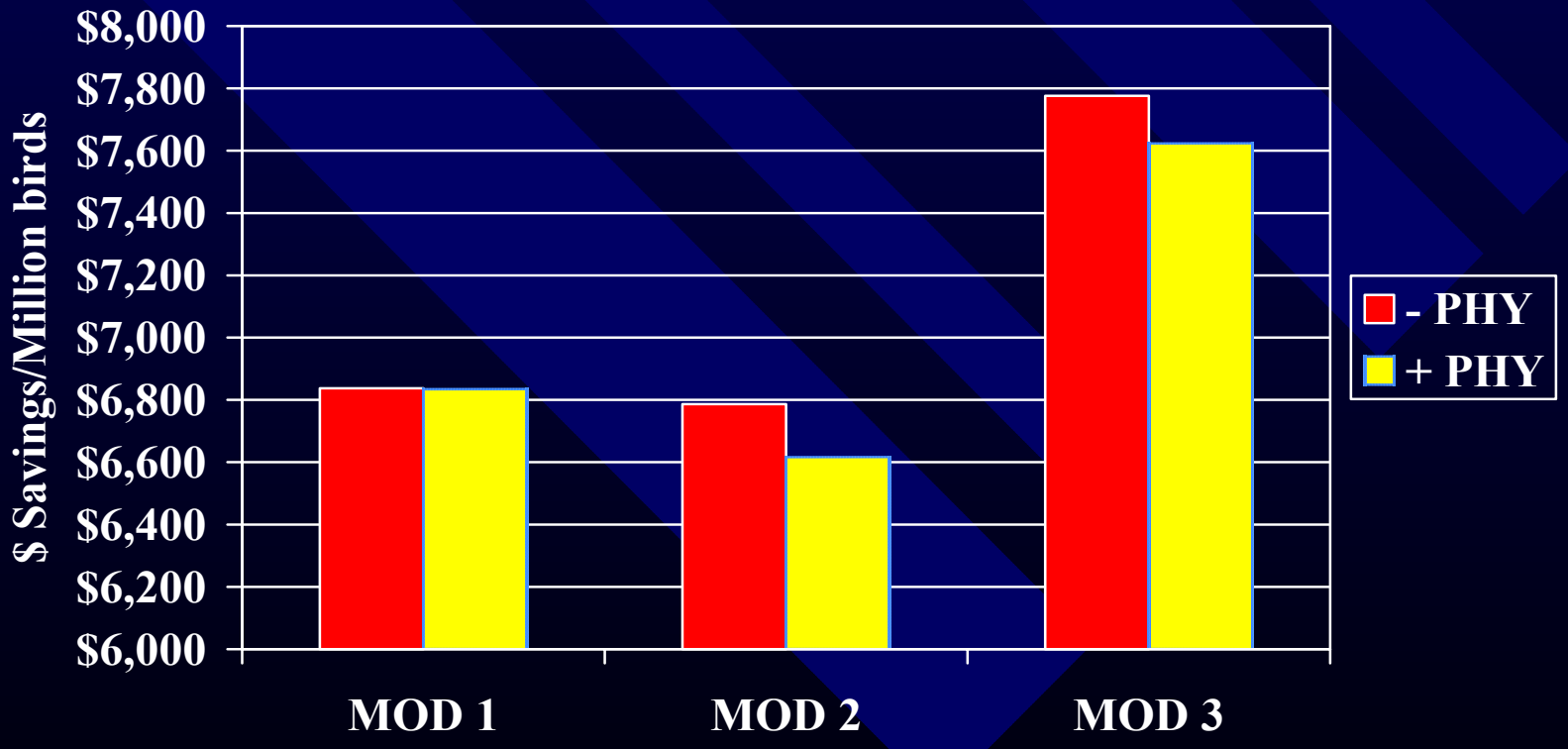


Soluble phosphorus content of litter from broilers fed different NPP programs with or without phytase



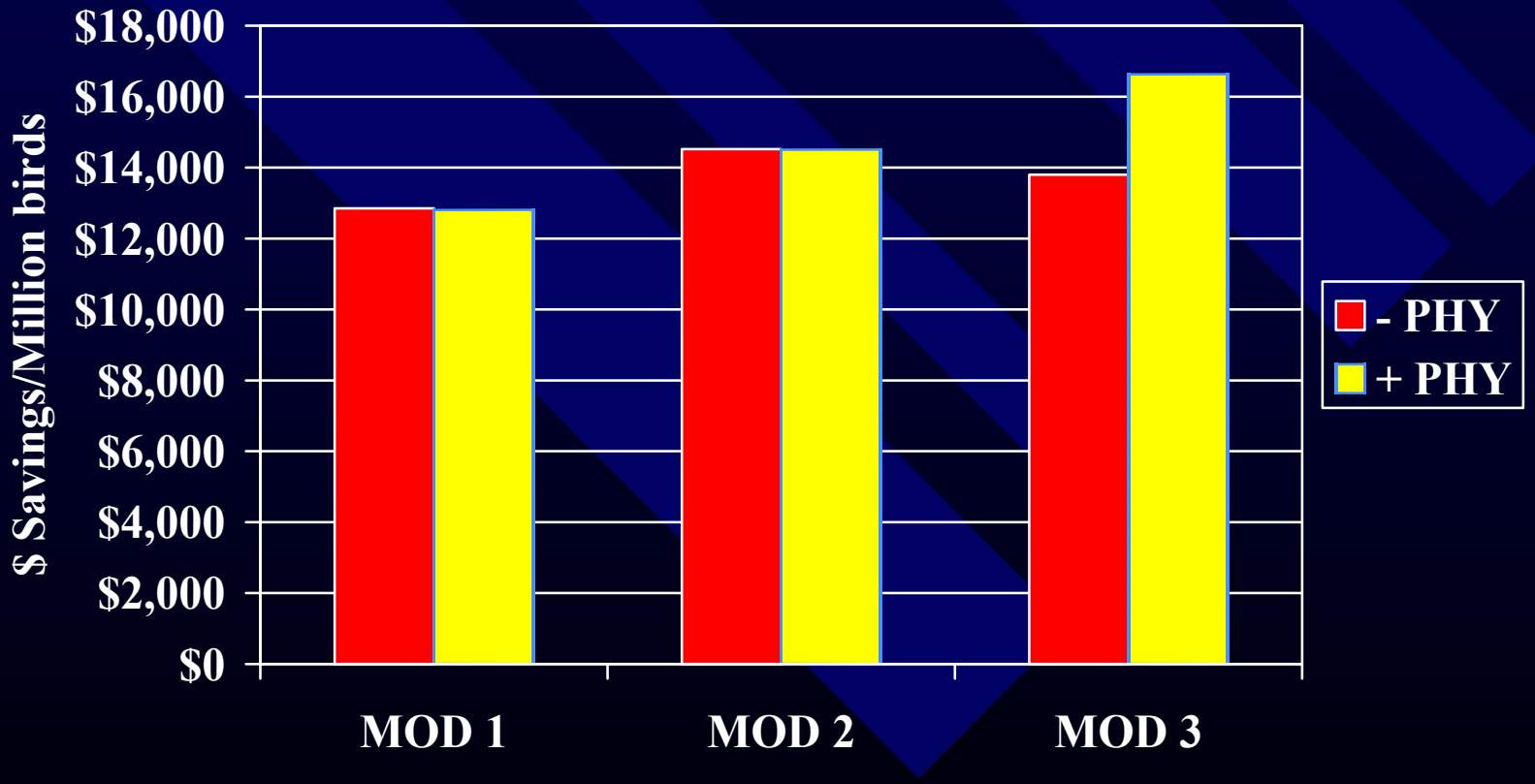
Savings in cost of supplemental phosphorus for birds grown to 42 d of age (2.44 kg/5.37 lb) *vs* industry feeding program

Does not consider cost of phytase where added



Savings in cost of supplemental phosphorus for birds grown to 56 d of age (3.39 kg/7.47lb) *vs* industry feeding program

Does not consider cost of phytase where added



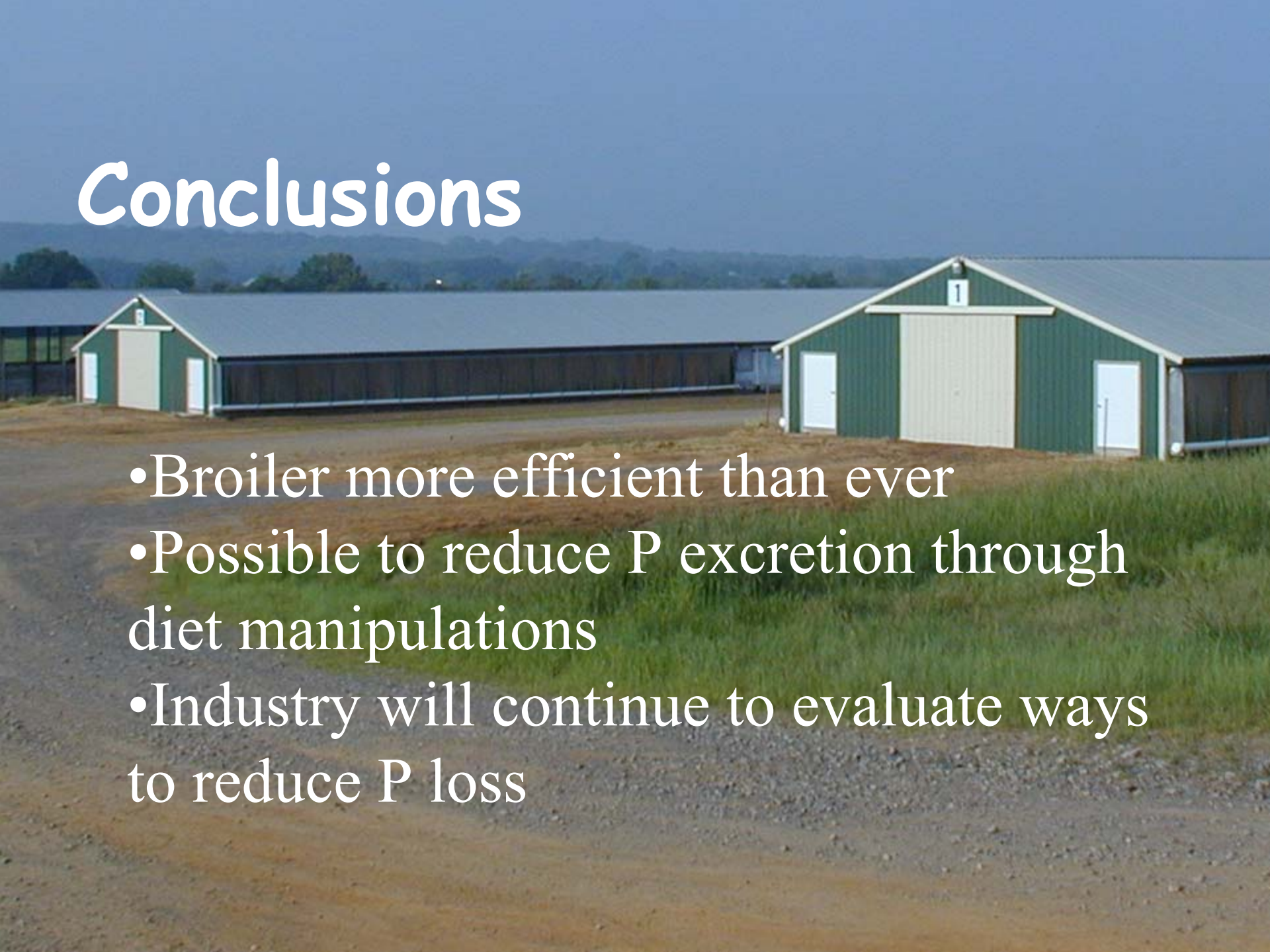
What can we do to minimize phosphorus excretion while providing adequate amounts for our animals?

- Use highly available sources of P to provide supplemental needs.
- Use phytase to maximize use of phytate-bound P from plant sources.
- Minimize the levels of phosphorus in the diet to match that of the animal, especially in the latter stages of growth where excesses are most likely.

Industry Proactive in Phosphorus Reduction Strategies

- New phytase sources are heat stabile and remain active after pelleting
- This a major breakthrough in utilization of phytase
- Industry continues to fine tune dietary levels of nutrients based on evolving information on availability of nutrients in commonly used ingredients

Conclusions



- Broiler more efficient than ever
- Possible to reduce P excretion through diet manipulations
- Industry will continue to evaluate ways to reduce P loss


QUESTIONS???
What happens when hens eat Fruit Loops!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TM